Laboratory Test Utilization; Improving Outcomes and Reducing Costs

Eugenio H. Zabaleta, Ph.D.
Clinical Chemist
OhioHealth Mansfield Hospital

February 28, 2017
Learning Objectives

Identify how the laboratory can partner with stakeholders across the healthcare system to reduce healthcare costs by properly utilizing laboratory tests

Define how laboratory test utilization and decision support tools can enable clinicians to improve patient outcomes

Demonstrate how the laboratory can be utilized to address the transition from fee-for-service to fee-for-value
Overutilization

- Ordering test panels* (tests as groups)
- Repetitive test orders* (daily orders)
- Incomplete understanding*
  - impact of low pre-test probability*
  - of the consequences of overutilization*
- Patient pressure* (“educated patients”, internet, advertisement)
- Defensive testing*
- Perverse financial incentives* (more tests = more revenue)
- Physicians have been thought to
  - “leave no stone unturned”
  - Patient harm
- Order patterns are influence by the presentation of the lab test orders
  - Providers are moving at fast-pace
- Training/practice (“I was taught that”, “I have always done that way”)

* Astion ML. 2006. Interventions that improve laboratory utilization: from gentle guidance to strong restrictions. Laboratory Errors and Patient Safety. 2(4):8-9
We are educated to think:

- Source of Error (Quality Assurance)
  - Pre-Analytical
  - Analytical
  - Post-Analytical

Common issues not covered:
- Over Utilization 
- Under Utilization 
- Wrong Order
- Off Label Use

We should be thinking:

George Lundberg (JAMA 1981:245:1762-1763) The brain-to-brain turnaround time loop
Example – IT Tools Available to Improve Lab Test Utilization

The Patient lives here

- Financial System
- Clinical System EMR
- EHR

Clinical Decision Support

Interface Engine

- Laboratory Information System (LIS)
- Point Of Care

- Instrument
- Data Instrument Manager
- Reference Lab

Example – IT Tools Available to Improve Lab Test Utilization

The Patient lives here

- Financial System
- Clinical System EMR
- EHR

Clinical Decision Support

Interface Engine

- Laboratory Information System (LIS)
- Point Of Care

- Instrument
- Data Instrument Manager
- Reference Lab

Example – IT Tools Available to Improve Lab Test Utilization

The Patient lives here

- Financial System
- Clinical System EMR
- EHR

Clinical Decision Support

Interface Engine

- Laboratory Information System (LIS)
- Point Of Care

- Instrument
- Data Instrument Manager
- Reference Lab
Getting the right diagnosis is a key aspect of health care: It provides an explanation of a patient’s health problem and informs subsequent health care decisions. For decades, diagnostic errors—inaccurate or delayed diagnoses—have represented a blind spot in the delivery of quality health care. Diagnostic errors persist throughout all settings of care and continue to harm an unacceptable number of patients.
Goals for Improving Diagnosis and Reducing Diagnostic Error

1. Facilitate more effective teamwork in the diagnostic process among health care professionals, patients, and their families
2. Enhance health care professional education and training in the diagnostic process
3. Ensure that health information technologies support patients and health care professionals in the diagnostic process
4. Develop and deploy approaches to identify, learn from, and reduce diagnostic errors and near misses in clinical practice
5. Establish a work system and culture that supports the diagnostic process and improvements in diagnostic performance
6. Develop a reporting environment and medical liability system that facilitates improved diagnosis by learning from diagnostic errors and near misses
7. Design a payment and care delivery environment that supports the diagnostic process
8. Provide dedicated funding for research on the diagnostic process and diagnostic errors

Test Utilization - Improving Diagnosis
Test Utilization Approaches

• Computerized Physician Order Entry (CPOE)
  – Order-set
  – Lab formulary
  – Duplicate Checking (Test Frequency)
  – Decision Support
    • Access to EBM/Guidelines at the point of entry
    • Alerts
    • Pop-up
  – Dx Algorithms

• Education
  – Physicians
  – Mid level Providers
  – Nursing
  – Patients (Patient Access Portal)
Test Utilization Approaches

• Interdisciplinary team work

• Analysis of Current Utilization Pattern
  – Standing orders
  – Redundancy (profiles, reflex testing)
  – Frequency

• Laboratory Champion/s (Clinician/s)

• Utilization Committee
  – Physician Peer Review/Score Card/Peer Comparison
  – Best Practice Ordering Guidelines
  – CMS Core Measures
What can I do?
**CPOE:**
Entry of physician orders and/or instruction for treatment into a computer rather than on paper.

**Order-set:**
A group of orders organized along a common theme: Signs or symptoms, Diagnosis, Procedure, etc.

**DKA Order Set**
Lab Orders

It is a Clinical Decision Support tool!

**Reminder**

**No longer Available**

One of the advantages of electronic order-sets: Old version is replaced with new version.

You can use CPOE/Order-sets to remove obsolete tests.

© Copyright 2017, Cardinal Health. All rights reserved. CARDINAL HEALTH, the Cardinal Health LOGO and ESSENTIAL TO CARE are trademarks or registered trademarks of Cardinal Health.
Best Evidence/CMS Core Measures

For **adults** patients: Ordering a single blood culture constitutes a substandard of care and should be avoided.*

CPOE Solution: Single BC orders not available for adults patients

New Sepsis CMS core measure (Oct-2015)

Data elements for the **Three Hour Bundle**:
1. *Initial lactate level collection*,
2. *Blood culture collection*,
3. Broad spectrum or other antibiotic administration and
4. Crystalloid fluid administration.

You can use CPOE/Order-sets to improve patient care/safety

*Principles and Procedures for Blood Cultures, Clinical Laboratory Standards Institute, M47-A Vol. 27, No. 17; May 2007.
Complete Blood Culture Menu

Inpatient Orders

ED Orders

Laboratory Formulary
Clinical Decision Support (simple)

General Postoperative Care Admit - CPOE

- **Right Test**
  - Troponin-I measurements for patients with high or intermediate clinical risk who have known or suspected CAD and who are undergoing high- or intermediate-risk surgical procedures.

- **Wrong Test**
  - Evidence for the use of a postoperative BNP level is inconclusive.

Blood Studies:
- CBC W/O Diff Next AM for 1 Days
- CHEM8 (Basic Metabolic) ASAP
- CHEM8 (Basic Metabolic) Next AM for 1 Days
- Comprehensive Metabolic Panel Next AM for 1 Days

Urine Studies:
- Urinalysis Routine
Clinical Decision Support (complex)

INR rule when physician orders Warfarin

1. If no INR results in the past 3 days:
   - Medication/IV
     - Warfarin 1 mg PO QD for 1 Doses
     - No INR results available within last 3 days.

2. If one INR result in the past 3 days:
   - Medication/IV
     - Warfarin 1 mg PO QD for 1 Doses
     - Results: INR = 1.5 (Obs. Date: 01-18-2011 06:18).

3. If two INR results in the past 3 days:
   - Medication/IV
     - Warfarin 2 mg PO QD for 1 Doses
     - Results: INR = 2.8 (Obs. Date: 01-18-2011 05:25); INR = 1.1 (Obs. Date: 01-17-2011 05:15).

When the physician orders the Warfarin the PT order is automatically ordered for the next day.

You can use CPOE/Order-sets to order the Right test at the Right time.
## Clinical Decision Support (clinical information)

### 2015 Antimicrobial % Susceptible Report OhioHealth Mansfield/Shelby

<table>
<thead>
<tr>
<th>Species</th>
<th># of isolates</th>
<th>AMPICILLIN</th>
<th>AZTREOMIDIN</th>
<th>PIPERACILLIN/TPAZOBACTAM</th>
<th>CEFZOLIN</th>
<th>CEFTRIAZIME</th>
<th>IMIPENEM</th>
<th>GENTAMICIN</th>
<th>CIPROFLOXACIN</th>
<th>LEVOFLOXACIN</th>
<th>NITROFURANTOIN</th>
<th>TRIMETH/ SULFA</th>
<th>CLINDAMYCIN</th>
<th>ERYTHROMYCIN</th>
<th>OXA CILLIN</th>
<th>PENCILLIN</th>
<th>RIFAMPIN</th>
<th>TETRACYCLINE</th>
<th>VIRAMOCYCLIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citrobacter freundii</td>
<td>94</td>
<td>91</td>
<td>1</td>
<td>89</td>
<td>89</td>
<td>98</td>
<td>95</td>
<td>95</td>
<td>94</td>
<td>91</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterobacter cloaceae</td>
<td>188 (55)</td>
<td>83</td>
<td>0</td>
<td>81</td>
<td>75</td>
<td>94</td>
<td>94</td>
<td>93</td>
<td>94</td>
<td>93</td>
<td>32</td>
<td>93</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>3185 (517)</td>
<td>47</td>
<td>(94)</td>
<td>96</td>
<td>86</td>
<td>95</td>
<td>92</td>
<td>92</td>
<td>65</td>
<td>65</td>
<td>93</td>
<td>72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klebsiella pneumoniae</td>
<td>756 (154)</td>
<td>89</td>
<td>83</td>
<td>87</td>
<td>85</td>
<td>99</td>
<td>88</td>
<td>83</td>
<td>83</td>
<td>34</td>
<td>82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proteus mirabilis</td>
<td>594 (104)</td>
<td>100</td>
<td>91</td>
<td>97</td>
<td>97</td>
<td>84</td>
<td>44</td>
<td>49</td>
<td>0</td>
<td>56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>659</td>
<td>100</td>
<td>91</td>
<td>97</td>
<td>97</td>
<td>84</td>
<td>44</td>
<td>49</td>
<td>0</td>
<td>56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterococcus sp.</td>
<td>840</td>
<td>36</td>
<td>36</td>
<td>85</td>
<td>87</td>
<td>85</td>
<td>87</td>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coag. Neg. Staph</td>
<td>356</td>
<td>86</td>
<td>93</td>
<td>53</td>
<td>53</td>
<td>31</td>
<td>44</td>
<td>10</td>
<td>97</td>
<td>74</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>1534</td>
<td>98</td>
<td>100</td>
<td>97</td>
<td>57</td>
<td>34</td>
<td>49</td>
<td>13</td>
<td>99</td>
<td>84</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Linked to Positive BC Result**
- **Linked to Antibiotic Orders**
- **In development**

Link CPOE orders and/or Lab Results to Useful Clinical Information
“YES” for unformed stools
“NO” for formed stools

Always “YES” (when ileus is suspected, formed stool is an acceptable specimen for testing)
**Clostridium difficile Algorithm**  
**Clinical Impact (Patients diagnosed with CDI)**

<table>
<thead>
<tr>
<th>Inpatients with “+” C. Diff. results</th>
<th>LOS (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Algorithm</td>
<td>12.9</td>
</tr>
<tr>
<td>Post-Algorithm</td>
<td>8.4</td>
</tr>
<tr>
<td>Reduction</td>
<td><strong>4.5</strong></td>
</tr>
</tbody>
</table>

Impact on Nursing: 49% decrease in RN’s stool collection

Overutilization: 52.5% decrease in C. difficile testing

The laboratory cost for C. difficile testing decreased 23% (from $5468.17 to $3972.66 per month)

**Analytical Performance**  
Nursing/Lab

**Test of Cure**  
Social Workers

**Patient Advocacy**  
(To Home ASAP)

Resulting in an average total hospital cost savings per patient of $9,849.50; this translates into a total annual savings of approximately $1.1 million per year.

http://www.medlabmag.com/article/1132/JanuaryFebruary_2014/Drive_Cost_and_Care_Improvements_with_a_C_diff_Testing_Algorithm/
The laboratory needs to develop Strong Lab-Providers Teamwork based on:
- Respect
- Equality
- Understand each others strength, weakness, workflow, regulations
Patient Center Care and the Triple Aim Initiative

1 - Improving the patient experience of care (including quality and satisfaction)*

2 - Improving the health of populations*

Patient-Centered Care

Patient Engagement

3 - Reducing the per capita cost of health care*

Patient Access Portals
It is Changing Clinical Practice

After Patient Access Portals
Before Patient Access Portals
Patient Access Portals
Patient education

“Graph button”
Patient Access Portals
The power of Patient Engagement

- **Clostridium *difficile* Algorithm**:  
  - Only diarrheal stools  
    (except when ileus is suspected)  
  - No repeat testing  
    (except when clinically indicated for one time)  
  - No test of cure

Test Utilization Approaches

- Interdisciplinary team work

- Analysis of Current Utilization Pattern
  - Standing orders
  - Redundancy (profiles, reflex testing)
  - Frequency

- Laboratory Champion/s (Clinician/s)

- Utilization Committee
  - Physician Peer Review/Score Card/Peer Comparison
  - Best Practice Ordering Guidelines
  - CMS Core Measures
Test Utilization

• Improving Diagnosis:
  – By leveraging EBM, IT, & Teamwork
    • Right test - Improve lab test utilization (avoid iatrogenic anemia)
    • Right time - No treatment delays
    • Right patient - Positive Patient Identification (avoid errors)
    • Right results - Automatic communication, alerts, interpretation, and/or call of clinical significant lab values

Laboratorians are the lab tests expert!
Quality Chasm Series: Health Care Quality Report

• Preventing Medication Errors: Quality Chasm Series (2007)

• Improving Diagnosis in Health Care (2015)

• Improving the Quality of Health Care for Mental and Substance-Use Conditions: Quality Chasm Series (2006)


• Keeping Patients Safe: Transforming the Work Environment of Nurses (2004)

• Fostering Rapid Advances in Health Care: Learning from System Demonstrations (2002)

• Priority Areas for National Action: Transforming Health Care Quality (2003)

• Health Professions Education: A Bridge to Quality (2003)

• Leadership by Example: Coordinating Government Roles in Improving Health Care Quality (2002)

• Crossing the Quality Chasm: A New Health System for the 21st Century (2001)

• To Err Is Human: Building a Safer Health System (2000)
Questions?

The information in this presentation is provided for educational purposes only and is not legal advice. It is intended to highlight laws you are likely to encounter, but is not a comprehensive review. If you have questions or concerns about a particular instance or whether a law applies, you should consider contacting your attorney.
Thank you